Desalinated seawater into pilot-scale drinking water distribution system: chlorine decay and trihalomethanes formation

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ABSTRACT

Residual chlorine decay and trihalomethanes (THM) formation of desalinated seawater by ultrafiltration (UF) and nanofiltration (NF) membranes in a pilot-scale water distribution system (DWDS) were investigated. Three-dimensional fluorescent features of two source waters including NF permeate and municipal water were studied. Sixteen groups of data-sets were obtained to explore the effects of initial chlorine concentration (ICC), dissolved organic carbon (DOC), and temperature on chlorine decay and THM formation in laboratory conditions and pilot-scale DWDS, respectively. A first-order model was applied to evaluate the chlorine decay of desalinated seawater and a new model combining ICC, DOC concentration, and temperature was obtained to determine the first-order decay coefficient. Other seven models describing the kinetics of chlorine decay were also applied and compared in this study. Total trihalomethanes (TTHM) formation kinetics was studied and first-order model was suggested to describe this formation. The relationship between TTHM formation and chlorine demand was demonstrated and the results showed that second-order polynomial model better described the relationship.

Keywords: Desalinated seawater; Pilot-scale drinking water distribution system (DWDS); Chlorine decay; Trihalomethanes (THM) formation